

**PATENT APPLICATION**  
**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of

Docket No: Q78201

Yutaka SHIBAHASHI, et al.

Appln. No.: 10/694,006

Group Art Unit: 3711

Confirmation No.: 3669

Examiner: Alyssa M. HYLINSKI

Filed: October 28, 2003

For: METHOD FOR ALTERNATELY EXPRESSING COLOR-MEMORIZING  
PHOTOCHROMIC FUNCTION IN TOY ELEMENT, AND AN ALTERNATELY  
COLOR-MEMORIZING PHOTOCHROMIC TOY

**AMENDED APPEAL BRIEF UNDER 37 C.F.R. § 41.37**

**MAIL STOP APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Responsive to the Notice of Non-Compliant Appeal Brief of November 25, 2009,  
Appellants submit the following. Appellants are not re-submitting the evidence listed in the  
Evidence Appendix, as the Notice indicated that the entire original Appeal Brief did not have to  
be re-submitted.

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**I. REAL PARTY IN INTEREST**

The Pilot Ink Co., Ltd. is the real party in interest, by virtue of an Assignment recorded in the USPTO on October 28, 2003, at Reel 14644, Frame 534.

**II. RELATED APPEALS AND INTERFERENCES**

Appellants, Appellants' legal representatives, and the Assignees of this application are not aware of any other appeals or interferences that will directly affect, or be affected by, or have a bearing on the Board's decision in the pending appeal.

### **III. STATUS OF CLAIMS**

Claims 1 and 3-16 are pending, with claim 2 being canceled.

Claims 9-14 have been withdrawn, pursuant to the Restriction Requirement of June 12, 2006.

Claims 1, 3, 6-7, and 15-16 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid (U.S. Patent No. 4,503,177), Mullis (U.S. Patent No. 5,436,115), Gordon (U.S. Patent No. 2,460,221), and Tomonaga (U.S. Application Publication No. 2002/0114956).

Claim 8 also stands rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, and Tomonaga.

Claims 4 and 5 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, Tomonaga, and Kamada (U.S. Patent No. 5,208,132).

Appellants are appealing the above rejections of claims 1, 3-8, and 15-16.

**IV. STATUS OF AMENDMENTS**

There are no outstanding amendments. The most recent amendment was the Amendment of November 19, 2007.

**V. SUMMARY OF THE CLAIMED SUBJECT MATTER**

Independent claim 1 recites a method for alternately expressing a color-memorizing photochromic function in a toy element. See page 1, lines 7-10 of the present specification. The method comprises arranging (1) a color-changing means under a contacted or non-contacted condition, which contains at least one of an ultraviolet ray absorbent and a light-shading pigment capable of shading at least ultraviolet rays; to (2) a toy element comprising a photochromic layer which maintains a coloring state by developing a color through the irradiation of ultraviolet rays or sunlight containing ultraviolet rays and changes into decolorizing state through its decolorization by the irradiation of visible light. See page 3, lines 9-20 of the present specification. The coloring state is visible in well-lighted areas. See the Examples of the present specification, e.g., Example 1, page 31, line 9 to page 32, line 10. In addition, the claim recites that the color-changing means changes the photochromic layer of the coloring state into a decolorizing state by cutting off ultraviolet rays of sunlight, and thereby effecting irradiation of visible light, and maintains the changed state. See page 3, lines 20-24 of the present specification. The photochromic layer contains a diaryl ethene photochromic compound, and expresses a function to memorize and maintain coloring and decolorizing states alternately. See page 3, line 24 to page 4, line 3 of the present specification.

Independent claim 3 recites an alternately color-memorizing photochromic toy. See page 1, lines 7-10 of the present specification. The toy comprises a toy element and a color changing means. The toy element comprises a photochromic layer which contains a diaryl ethene photochromic compound, maintains a coloring state by developing a color through the irradiation of ultraviolet rays or sunlight containing ultraviolet rays and changes into decolorizing state

through its decolorization by the irradiation of visible light. See page 4, lines 4-10 of the present specification. The color-changing means which contains at least one of an ultraviolet ray absorbent and a light-shading pigment capable of shading at least ultraviolet rays, changes the photochromic compound of the coloring state into decolorizing state by cutting off ultraviolet rays of sunlight and thereby effecting irradiation of visible light, and maintains the changed state. See page 4, lines 11-16. The claim also recites that the coloring state is visible in well-lighted areas. See the Examples of the present specification, e.g., Example 1, page 31, line 9 to page 32, line 10. Further, a function to memorize and maintain coloring and decolorizing states alternately is expressed by arranging the color-changing means under such a condition that it is contacted or non-contacted with the photochromic layer. See page 4, lines 17-20 of the present specification.

By way of a non-limiting example to illustrate the presently claimed invention, Appellants refer to Figs. 1-4 submitted herewith. Figs. 1-4 were originally presented in the Response of August 7, 2008 and are resubmitted with the present Appeal Brief.

The left half of Fig. 1 shows the image of a butterfly printed with diarylethene (blue) ink on a sheet of paper, when that image is viewed in sunlight (e.g., as it would be seen if a person were looking at the paper outside). The left half of Fig. 2 shows the same butterfly image as it appears when a sheet having an ultraviolet ray absorbent is placed over the top of the paper. As can be seen from Fig. 2, the sheet having an ultraviolet ray absorber prevents the diarylethene butterfly image from being visible. When the sheet is removed, the butterfly image from Fig. 1 reappears. Relevant to the rejections at issue, the left half of Fig. 4 shows the same butterfly image (or rather, lack thereof) when viewed in the dark. Simply put, the diarylethene ink does

not glow in the dark. The right hand sides of Figs. 1-4 relate to the art cited by the Examiner, and will be discussed in the appropriate section of the Appeal Brief.



**VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Appellants respectfully request the review of the following rejections:

- I. The rejection of claims 1, 3, 6-7, and 15-16 under 35 U.S.C. § 103 as allegedly being unpatentable over Reid (U.S. Patent No. 4,503,177), Mullis (U.S. Patent No. 5,436,115), Gordon (U.S. Patent No. 2,460,221), and Tomonaga (U.S. Application Publication No. 2002/0114956).
- II. The rejection of Claim 8 under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, and Tomonaga.
- III. The rejection of Claims 4 and 5 under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, Tomonaga, and Kamada (U.S. Patent No. 5,208,132).

## **VII. ARGUMENT**

### **A. Argument regarding the rejection of claims 1, 3, 6-7, and 15-16 based on Reid, Mullis, Gordon, and Tomonaga**

Claims 1, 3, 6-7, and 15-16 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid (U.S. Patent No. 4,503,177), Mullis (U.S. Patent No. 5,436,115), Gordon (U.S. Patent No. 2,460,221), and Tomonaga (U.S. Application Publication No. 2002/0114956). Appellants respectfully traverse on the basis that (1) the photochromic compounds disclosed in Reid, Mullis, and Tomonaga are distinct from the luminescent compounds in Gordon, and thus there is no reason to combine the teachings of the references as set forth in the Office Action; (2) Reid and Tomonaga are incombable with Mullis because Mullis discloses an irreversible color change, as opposed to a reversible color change; (3) the color changing means in Gordon do not render obvious the presently recited color changing means; (4) Reid, Mullis, Tomonaga, and Gordon are nonanalogous art; and (5) the rejections are based on improper hindsight reasoning. Appellants note that these arguments pertain to the rejections of all of the claims, and that the dependent claims are not being argued separately.

Appellants believe that the Examiner's position is that it would have been obvious to use the photochromic dye in Tomonaga in the "element" in Reid, and to then use the element as a toy, allegedly as per the teaching in Mullis. The presently recited "color changing means" is allegedly provided by combining part of the teachings of Gordon - namely a "quenching or erasing means" - with the toy. See column 1, lines 30-31 and column 2, line 51 to column 3, line 6 of Gordon.

**I. The photochromic compounds disclosed in Reid, Mullis, and Tomonaga are distinct from the luminescent compounds in Gordon**

Appellants first respectfully submit that the art is not as interchangeable as the Examiner believes. The presently claimed invention relates to the use of photochromic compounds. Yet, Gordon, which the Examiner cites for its teaching of an alleged color changing means, does not relate to a photochromic compound at all. Rather, it relates to a luminescent compound. A person having ordinary skill in the art would not have understood that the teachings in Gordon relating to a luminescent compound are combinable with the teachings in Reid, Mullis, and Tomonaga relating to a photochromic compound.

As background, Gordon relates to an amusement device including a light-sensitive coating 13, which includes a light accumulating material, such as zinc sulfide. In accordance with the amusement device in Gordon, it is possible to provide all or part of a sheet with a luminescent property, i.e., a glowing property (see column 1, lines 9-12 of Gordon). The glowing portions of the sheet then fade away or may be “erased” (see column 2, lines 8-9 and column 1, lines 20-21 of Gordon).

In contrast, the presently claimed invention relates to a toy provided with a photochromic layer containing a diaryl ethene photochromic compound. According to the toy of the present invention, the diarylethene-containing photochromic layer maintains a coloring state via irradiation by UV rays or sunlight containing UV rays, and then changes into a decolorizing state via subsequent irradiation by visible light. In other words, the color of the toy changes between the coloring state and decolorizing state.

Appellants previously submitted technical documentation showing the distinctness of photochromicity and luminescence. For ease of the Board's reference, Appellants submit again passages from (1) *The Macmillan Encyclopedia of Physics*; and (2) *Principles and Applications of Photochemistry*, which show that it is known in the art that photochromism is distinct from luminescence. On page 1177 of *The Macmillan Encyclopedia of Physics* and pages 66-69 of *Principles and Applications of Photochemistry*, luminescence is discussed. Each reference describes luminescence as a quantum effect in which an atom that is excited by a photon decays into a lower energy state via an intermediate state. Conversely, photochromism, which is discussed on pages 219-220 of *Principles and Applications of Photochemistry*, is a photoinduced color change achieved through, for example, isomerization, dissociation, and charge-transfer or redox reactions. The distinctions between luminescence and photochromism are illustrated in those diagrams disclosing the mechanisms of luminescence and photochromism, found on pages 68 and 220 of *Principles and Applications of Photochemistry*, respectively. These references clearly show that photochromism and luminescence are distinct phenomena.

Also distinguishing the luminescent properties of Gordon from the photochromic properties of the other cited art is that the color change between the coloring state and decolorizing state in the presently claimed invention is visible in a well-lighted area. On the other hand, the luminescent product in Gordon is visible in a dark area (i.e., a glow-in-the-dark product).

Additionally, unlike the presently claimed invention, the luminescent state, or glow state, in Gordon is not maintained. Rather, "the glow or luminescent effect will...fade away" over

time (column 2, lines 8-9). In the presently claimed invention, the coloring state or decolorizing state can be maintained.

In view of the above, Appellants respectfully submit that a person having ordinary skill in the art would not recognize that the teachings from Gordon, which relates to luminescent compounds, are applicable to teachings related to photochromic compounds. Accordingly, Appellants respectfully request that the rejection be reversed on this basis.

**II. Reid and Tomonaga are incombining with Mullis because Mullis discloses an irreversible color change, as opposed to a reversible color change**

According to the position set forth by the Examiner, Reid and Tomonaga disclose reversible color changeable objects. The Examiner then combines these teachings with Mullis to allegedly render obvious the presently claimed invention. However, the Examiner's rejection ignores the teaching in Mullis that the color change therein is irreversible. There is no reason provided in the cited art regarding why, or even if, the irreversible color change dye in Mullis could be substituted with a dye according to Reid and Tomonaga.

Mullis discloses an irreversible color change and a photoacid progenitor compound which undergoes a reaction into a photoacid when it is radiated by ultraviolet rays. The photochemical reaction system in Mullis responds to ultraviolet rays by changing the color of the dyestuff via acidification.

In Mullis, a dyestuff that changes color based on pH is used as a pH indicator. A dyestuff of bromthymol blue changes color to blue in alkaline pH's, green in neutral pH's, and yellow in acidic pH's. It is a system in Mullis that visibly identifies a cumulative amount of ultraviolet rays. The system utilizes the photoacid progenitor, which may change to a photoacid as

discussed above, and also changes the color of the dyestuff so that the pH shifts to an acidity range which is radiated by the ultraviolet ray, thereby visibly identifying the radiation amount by color. For example, bromthymol blue is used as the indicator dyestuff, which is blue at first, then yellow-green after fifteen minutes of sunlight, and then yellow after sixty minutes of sunlight. The elapsed time in sunlight is determined by the color. Therefore, the color change of the photochemical reaction system of Mullis is irreversible.

Appellants acknowledge that Mullis uses a common pH indicator that reversibly changes the color by pH, but note that this does not correspond to the presently claimed invention, nor has the Examiner asserted that it does.

The Examiner has not cited a reason why a person having ordinary skill in the art would substitute a reversible color change system for the irreversible color system in Mullis, given that such a substitution would be contrary to the teachings in Mullis. Appellants respectfully submit that there is no reason, and respectfully submit that the cited references do not render the presently claimed invention obvious. Accordingly, reversal on this ground is also respectfully requested.

### **III. The color changing means in Gordon do not render obvious the presently recited color changing means**

As discussed above, Gordon discloses a luminescent amusement device that contains a light sensitive layer containing a light accumulating material, such as a zinc sulfide. Even though Gordon relates to luminescent compounds, the Examiner has cited Gordon for its alleged teaching of a color changing means as recited in the present claims. To illustrate that a person having ordinary skill in the art would not understand the color changing means in Gordon to

correspond to the presently recited color changing means, Appellants refer to Figs. 1-4, which were previously submitted in the Response of August 7, 2008 and are being resubmitted with the present Appeal Brief.

Figs. 1-4 compare a printing ink having the presently recited diarylethene photochromic compound with a printed material made using a printing ink containing zinc sulfide, such as that disclosed within Gordon.

As can be seen from the Figures, when the printed material is exposed to sunlight, the picture having the diarylethene photochromic compound is visible. However, the picture having the zinc sulfide is not visible. See Fig. 1. Conversely, when a sheet having an ultraviolet ray absorbent is put on top of the printed material and is exposed to sunlight, the picture having the diarylethene photochromic compound is not visible, either. See Fig. 2.

When a red sheet, as described in Gordon, is put on top of the printed material in Fig. 1 and exposed to sunlight, the picture having the zinc sulfide does not change and is not visibly identifiable as anything. See Fig. 3. On the other hand, after the printed material is exposed to sunlight, the picture having zinc sulfide is visible in the dark (i.e., it is glow-in-the-dark), whereas the diarylethene image is not visible. See Fig. 4 (showing the images as they appear in the dark after exposure to sunlight).

In view of the above, a person having ordinary skill in the art would not recognize that the color changing means in Gordon (relating to luminescent compounds) would perform a similar function when used in a photochromic application. In fact, Figs. 1-4 are indicative of the fact that the color changing means in Gordon has a different effect on the image in Gordon than it would have on a photochromic compound. Thus, a person having ordinary skill in the art

would not understand that the color changing means in Gordon was useful as a color changing means in a photochromic application. The Board is respectfully requested to reverse the rejection on this ground, as well.

**IV. Reid, Mullis, Tomonaga, and Gordon are nonanalogous art**

As mentioned above, Reid, Mullis, and Tomonaga relate to photochromic materials, whereas Gordon relates to luminescent materials. As such, these references are nonanalogous art for at least the reasons set forth above.

The Examiner has asserted that the references are not nonanalogous art because the Examiner has improperly defined the field of art so broadly (“creating interesting visual effects on light sensitive substrates,” see Office Action of July 20, 2009 at 6) that any reference dealing with any light sensitive material in any application may be used, regardless of the limitations that would accompany those light sensitive materials or applications. Appellants have already explained that a person having ordinary skill in the art would not understand that certain teachings related to luminescent materials are transferable to photochromic materials. The Examiner should not be permitted to rebut this argument by merely ignoring the differences between luminescent and photochromic properties in order to state that they are analogous arts.

The Board is respectfully requested to reverse the Examiner’s rejection on this ground, as well.

**V. The rejections are based on improper hindsight reasoning**

Given Appellants’ above positions with respect to the Examiner’s rejection, it follows that the Examiner’s rejections were necessarily based upon improper hindsight by picking and choosing elements from the prior art, using the present specification as a guide.



The Examiner cites the color changing means in Gordon, yet does not pay attention to the fact that in Gordon, the color changing means is a color changing means for a luminescent material. The Examiner cites the toy Mullis, yet does not say anything about the fact that the color changing mechanism in Mullis is irreversible, which is contrary both to the other cited references and to the present claims. The Examiner cites the reversible color changing mechanism in Reid, but does not explain how the merely prophetic portion that is cited (“**In certain circumstances it may** be possible to use radiation of a different wavelength or band of wavelengths to erase an image,” see Reid at column 4, lines 18-20, emphasis added) would lead a person having ordinary skill in the art to the presently claimed invention, or even enable a person having ordinary skill in the art to practice the presently claimed invention.

Accordingly, Appellants respectfully submit that the piecemeal application of the references indicates that improper hindsight reasoning was the basis of the rejections, and Appellants respectfully request that the rejections be reversed on this basis.

**B. Argument regarding the rejection of claim 8 based on Reid, Mullis, Gordon, and Tomonaga**

Claim 8 stands rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, and Tomonaga. Appellants respectfully submit that claim 8, which ultimately depends from claim 3, is patentable for at least the reasons listed in Sections I-V, above. Accordingly, Appellants respectfully request that the rejection of claim 8 be reversed on those grounds.

**C. Argument regarding the rejection of claims 4 and 5 based on Reid, Mullis, Gordon, Tomonaga, and Kamada**

Claims 4 and 5 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Reid, Mullis, Gordon, Tomonaga, and Kamada (U.S. Patent No. 5,208,132). Claims 4 and 5 ultimately depend from claim 3, and Appellants respectfully submit that Kamada does not remedy the deficiencies set forth with respect to Reid, Mullis, Gordon, and Tomonaga which are discussed above. Accordingly, Appellants respectfully request that the rejection of claims 4 and 5 be reversed on those grounds.

***Conclusion***

In view of the above, Appellants respectfully submit that the presently claimed invention is not rendered obvious by the cited references, and respectfully request the reversal of the rejections discussed above.

The USPTO is directed and authorized to charge the statutory fee (37 C.F.R. §41.37(a) and 1.17(c)) and all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/ Travis B. Ribar /

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**65565**

CUSTOMER NUMBER

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Date: December 10, 2009

**CLAIMS APPENDIX**

CLAIMS ON APPEAL:

1. A method for alternately expressing a color-memorizing photochromic function in a toy element, which comprises

arranging (1) a color-changing means under a contacted or non-contacted condition, which contains at least one of an ultraviolet ray absorbent and a light-shading pigment capable of shading at least ultraviolet rays,

to (2) a toy element comprising a photochromic layer which maintains a coloring state by developing a color through the irradiation of ultraviolet rays or sunlight containing ultraviolet rays and changes into decolorizing state through its decolorization by the irradiation of visible light,

wherein the coloring state is visible in well-lighted areas,

wherein said color-changing means changes said photochromic layer of the coloring state into decolorizing state by cutting off ultraviolet rays of sunlight and thereby effecting irradiation of visible light, and maintains the changed state, and

wherein said photochromic layer contains a diaryl ethene photochromic compound,

so as to express a function to memorize and maintain coloring and decolorizing states alternately.

2. (canceled).

3. An alternately color-memorizing photochromic toy comprising:

a toy element comprising a photochromic layer which contains a diaryl ethene photochromic compound, maintains a coloring state by developing a color through the irradiation of ultraviolet rays or sunlight containing ultraviolet rays and changes into decolorizing state through its decolorization by the irradiation of visible light; and

a color-changing means which contains at least one of an ultraviolet ray absorbent and a light-shading pigment capable of shading at least ultraviolet rays, changes said photochromic compound of the coloring state into decolorizing state by cutting off ultraviolet rays of sunlight and thereby effecting irradiation of visible light, and maintains the changed state,

wherein the coloring state is visible in well-lighted areas, and

wherein a function to memorize and maintain coloring and decolorizing states alternately is expressed by arranging said color-changing means under such a condition that it is contacted or non-contacted with said photochromic layer.

4. The alternately color-memorizing photochromic toy according to claim 3, wherein said diaryl ethene photochromic compound is included in microcapsules.

5. The alternately color-memorizing photochromic toy according to claim 3, wherein said photochromic layer is any one of a printing or coating layer, a printing image and a writing image, which contains at least said diaryl ethene photochromic compound and a binder resin.

6. The alternately color-memorizing photochromic toy according to claim 3, wherein said photochromic layer is a molding prepared by integrally blending said diaryl ethene photochromic compound with a thermoplastic resin.

7. The alternately color-memorizing photochromic toy according to claim 3, wherein said color-changing means is a sheet-shaped molding prepared by integrally blending at least one of said ultraviolet ray absorbent and said light-shading pigment capable of shading at least ultraviolet rays with a transparent plastic.

8. The alternately color-memorizing photochromic toy according to claim 7, wherein a rapping image is arranged inside of said sheet-shaped molding.

9. The alternately color-memorizing photochromic toy according to claim 3, wherein said color-changing means is any one of a printing or coating layer, a printing image and a writing image, in which at least one of said ultraviolet ray absorbent and said light-shading pigment capable of shading at least ultraviolet rays is fixed in a dissolved or dispersed state to a binder resin.

10. The alternately color-memorizing photochromic toy according to claim 9, wherein any one of a printing or coating layer, a printing image and a writing image is directly arranged on said photochromic layer of a toy element.

11. The alternately color-memorizing photochromic toy according to claim 9, wherein any one of said printing or coating layer, said printing image and said writing image is arranged on a transparent plastic sheet.

12. The alternately color-memorizing photochromic toy according to claim 3, wherein said color-changing means is in the form of plastic or fluid material in which at least one of said ultraviolet ray absorbent and said light-shading pigment capable of shading at least ultraviolet rays is dissolved or dispersed.

13. The alternately color-memorizing photochromic toy according to claim 3, wherein said color-changing means is a cloth constituted from transparent fibers prepared by fixing at least one of said ultraviolet ray absorbent and said light-shading pigment capable of shading at least ultraviolet rays on the surface or by blending therewith.

14. The alternately color-memorizing photochromic toy according to claim 3, wherein said color-changing means is a visible light irradiator whose main light generation range is in the visible light.

15. The alternately color-memorizing photochromic toy according to claim 3, wherein said coloring state is changed by an ultraviolet ray irradiator which irradiates ultraviolet rays.

16. The alternately color-memorizing photochromic toy according to claim 3, wherein a general purpose dyestuff or pigment is allowed to coexist in said photochromic layer.

**EVIDENCE APPENDIX:**

Pursuant to 37 C.F.R. § 41.37(c)(1)(ix), submitted herewith are copies of any evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellants in the appeal:

- Figs. 1-4, which were previously submitted in the Response of August 7, 2008;
- Page 1177 of *The Macmillan Encyclopedia of Physics* and pages 66-69 of *Principles and Applications of Photochemistry*, previously submitted in the Amendment of November 19, 2007.



**RELATED PROCEEDINGS APPENDIX**

Appellants note that there are no decisions rendered by a court or the Board in any proceeding identified in Section II pursuant to 37 C.F.R. § 41.37(c)(1)(ii).